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# OSTP Mission

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OSTP's mission was established by Congress in 1976

- 1. Advise the President** (and by implication, EOP.)
- 2. Lead interagency effort** to develop sound S&T policies & budgets.  
(NSTC, IWGs, work with individual agencies)
- 3. Work with the private sector** to match S&T investments to needs.
- 4. Build strong partnerships** among Federal, State, and local governments, other countries, and the scientific community.
- 5. Evaluate** the scale, quality, and effectiveness of the Federal effort in science and technology.

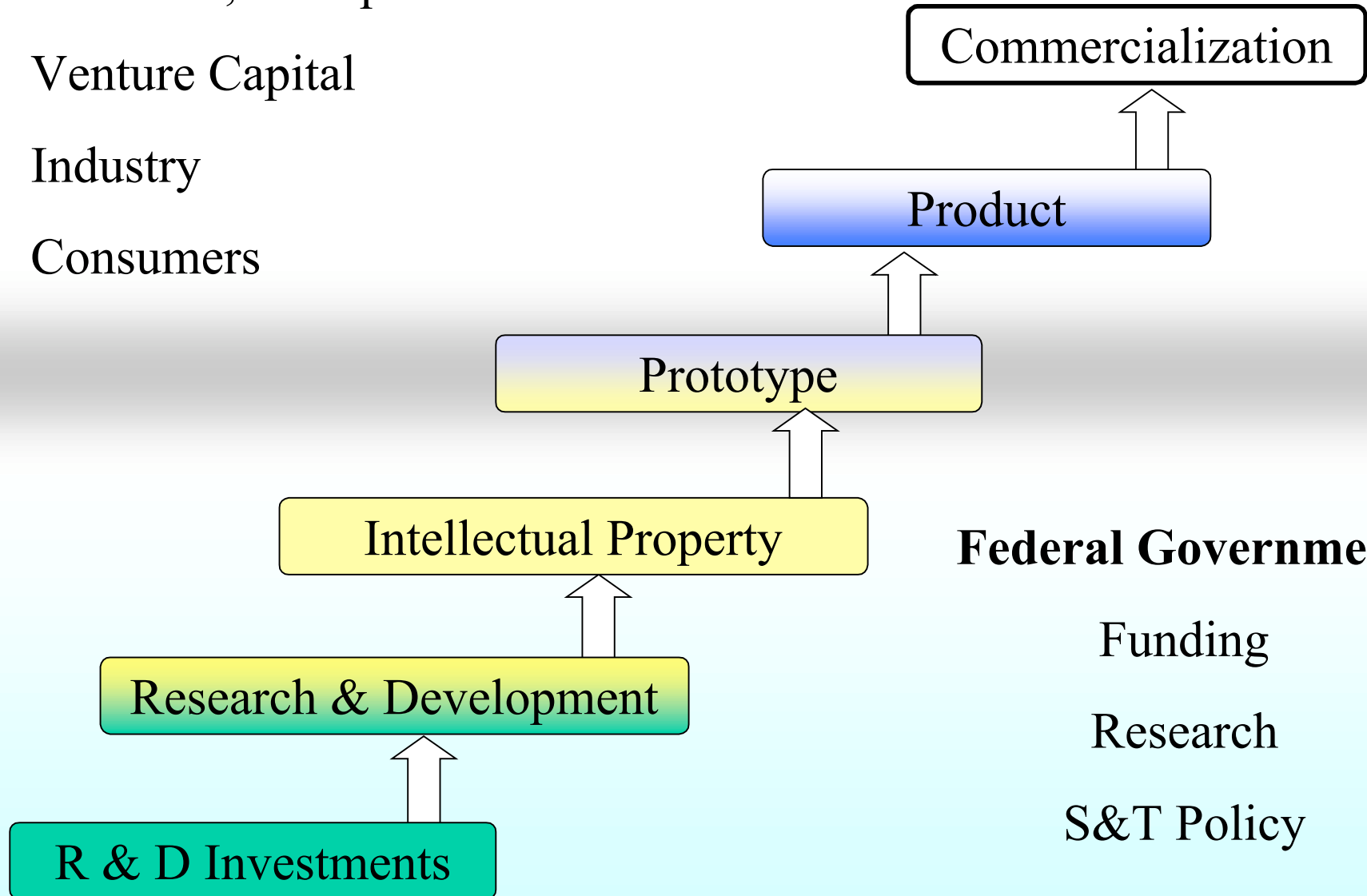
## Private Sector

Inventors, Entrepreneurs

Venture Capital

Industry

Consumers



Commercialization

Product

Prototype

Intellectual Property

Research & Development

R & D Investments

## Federal Government

Funding

Research

S&T Policy

Legislation

# Factors that Define Current Frontiers in R&D

## Scientific Push

- Bio & Biomedicine
- Materials Science (nano)
- IT

## Societal Pull

- **Homeland & National Security**
- **Energy**
- **Economic Security**
- Health
- Environment
- Food

## R&D Environment

- Investment
- Policy and Leg.
- Research Tools
- People
- Regulation

# Challenges in R&D Strategy

- *Shifting R&D Budget Allocations*

- \* increase in private sector funding/ changes in performers
- \* reallocation of funds among disciplines

- *Human resource issues*

- \* security issues
- \* globalization of business
- \* shifting demographics, poor performance

- *Organizational issues with R&D funding system*

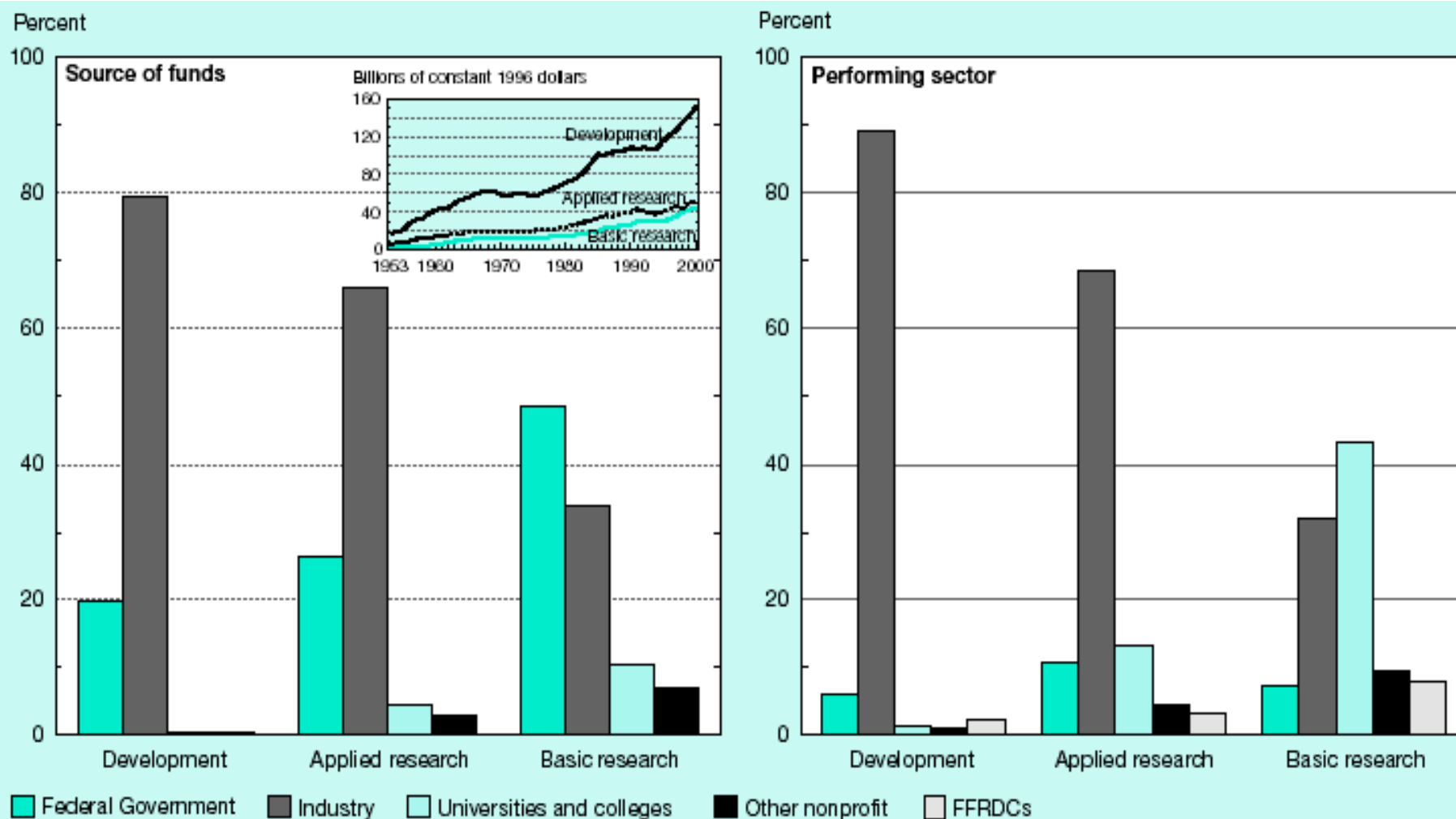
- \* disjointed & stove piped funding streams

- *R&D investment criteria, priorities, effectiveness*

- *greater emphasis on what we are getting for our \$*

- *Increasing International Competition*

# 2000 R&D Expenditures



FFRDCs = Federally Funded Research and Development Centers

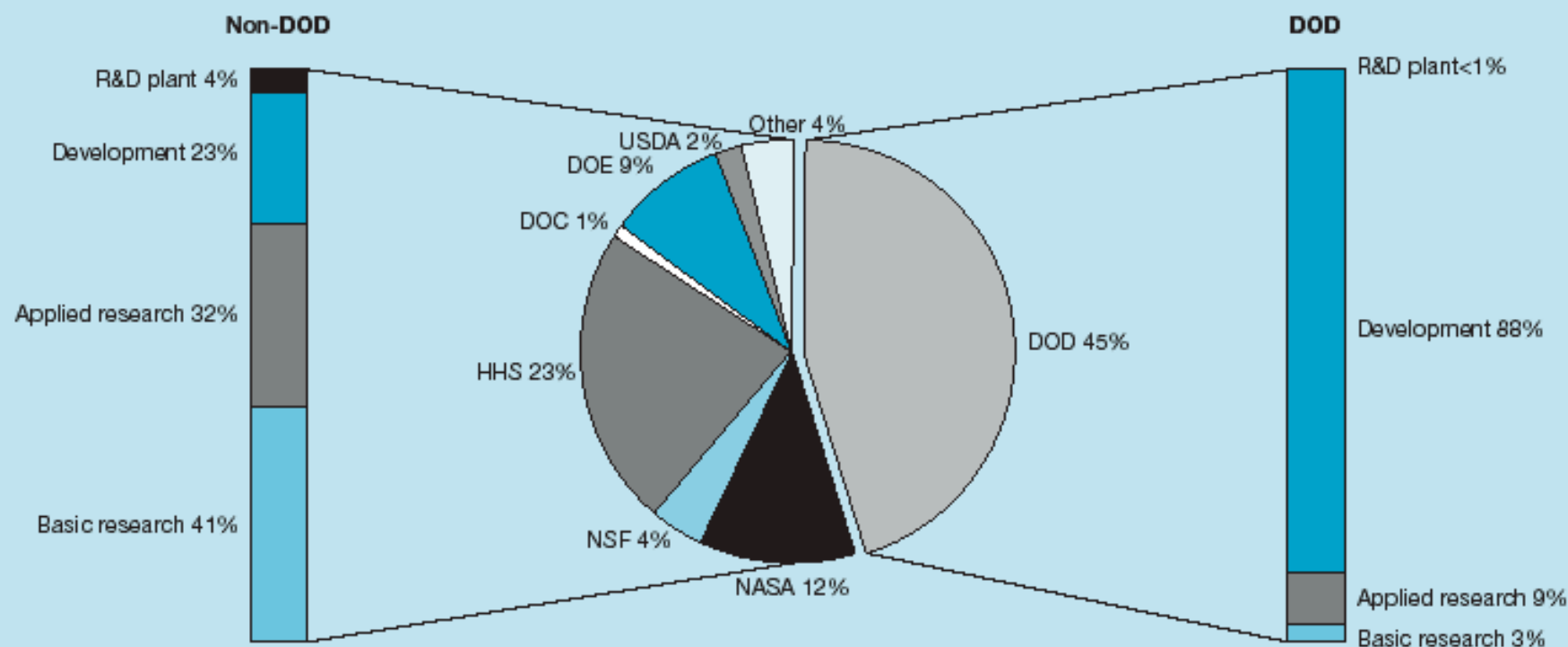
See appendix tables 4-7 through 4-18.

Science & Engineering Indicators – 2002

# FY 2001 Funding by Agency and Character of Work

Figure 4-13.

Projected Federal obligations for R&D and R&D plant, by agency and character of work: FY 2001



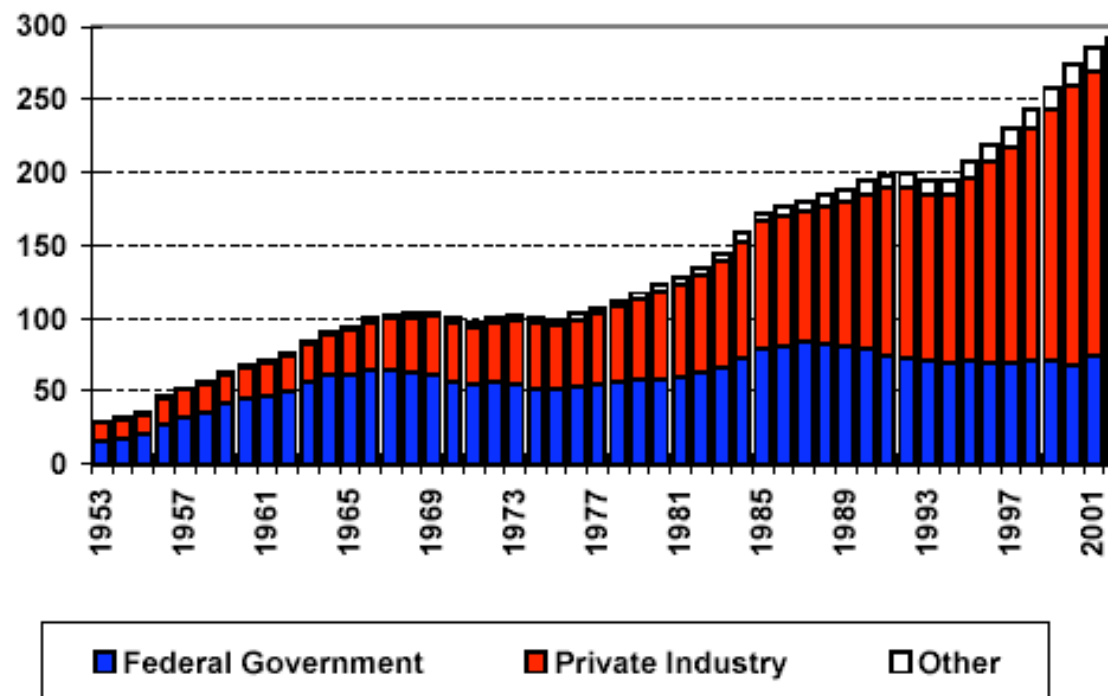
DOC = Department of Commerce; DOE = Department of Energy; DOD = Department of Defense; HHS = Department of Health and Human Services; NSF = National Science Foundation; NASA = National Aeronautics and Space Administration; USDA = U.S. Department of Agriculture

See appendix table 4-25.

Science & Engineering Indicators – 2002

# Changes in Funding Sources

U.S. R&D Funding by Source, 1953-2002  
expenditures in billions of constant 2002 dollars



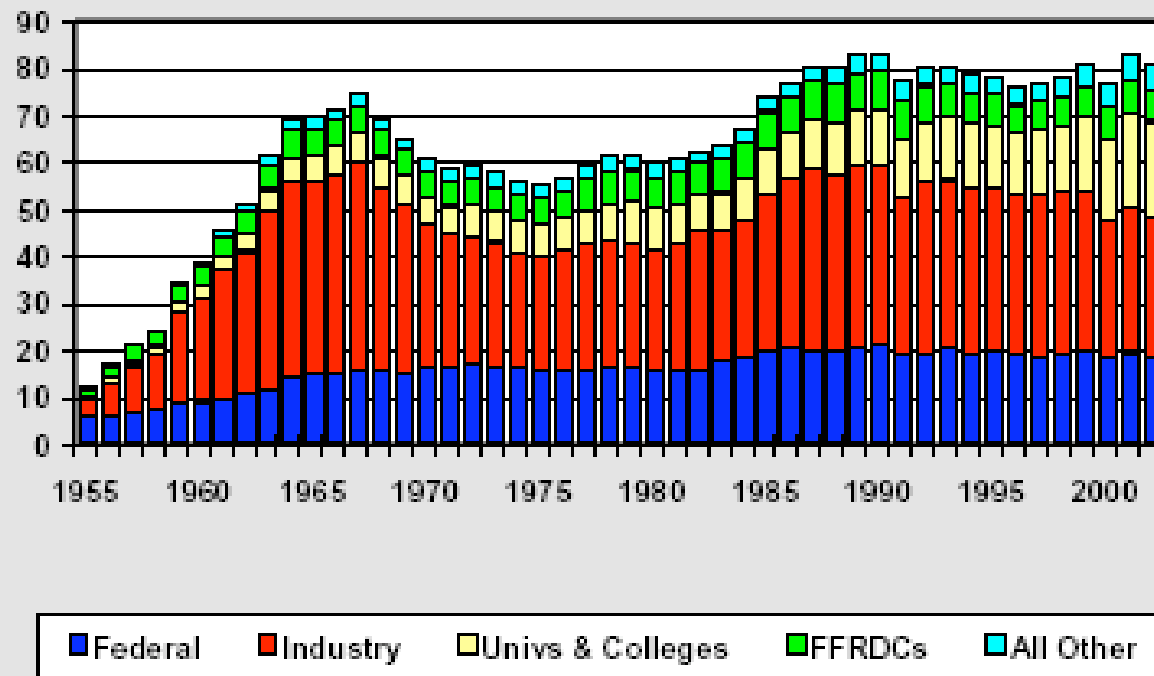
Source: NSF, Division of Science Resources Statistics. (Data for 2001 and 2002 are preliminary.)  
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# Changes in R&D Funding Recipients

## Federal R&D Funding by Performer, FY 1955-2002

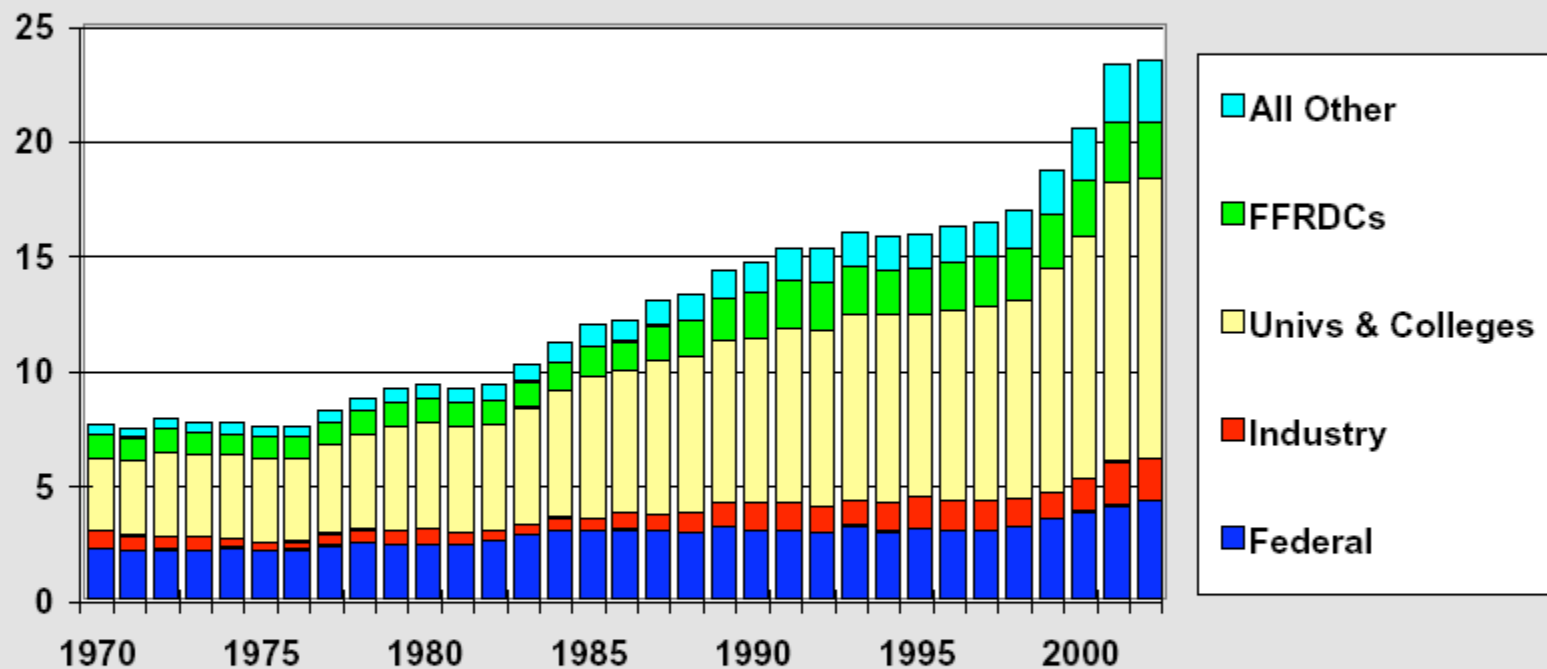
Obligations in billions of constant FY 2002 dollars



Source: AAAS, based on NSF, *Federal Funds for Research and Development Fiscal Years 2000, 2001, and 2002* and *Federal Funds Historical Tables*, 2002. FY 2001 and 2002 data are preliminary. Excludes R&D facilities funding.  
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## Federal BASIC RESEARCH by Performer, FY 1970-2002

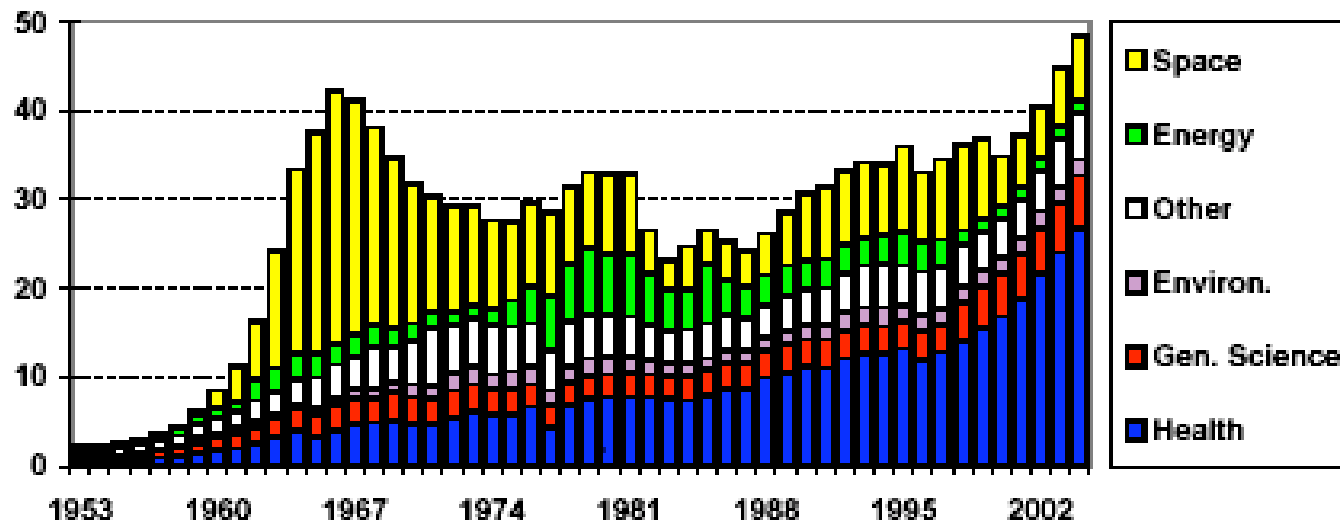
Obligations in billions of constant FY 2002 dollars



Source: NSF, *Federal Funds for Research and Development Fiscal Years 2000, 2001, and 2002* and *Federal Funds Historical Tables*, 2002. FY 2001 and 2002 data are preliminary.  
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# Reallocation of R&D Among Disciplines

**Trends in Nondefense R&D by Function, FY 1953-2004**  
outlays for the conduct of R&D, billions of constant FY 2003 dollars



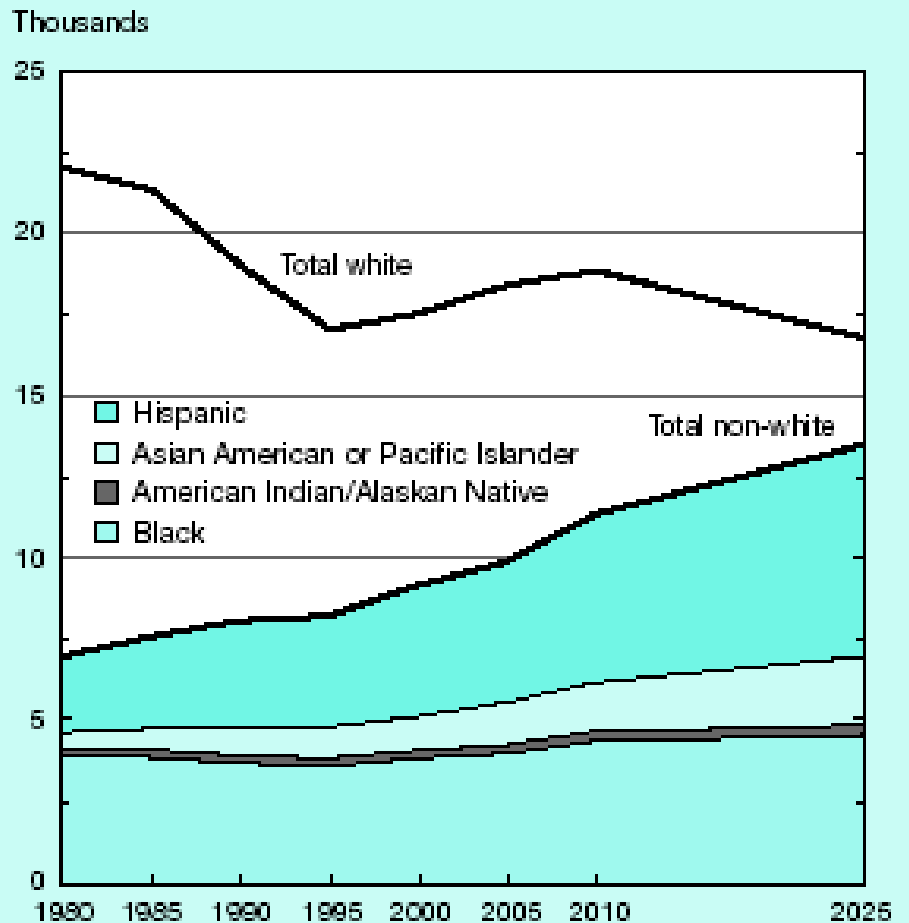
Source: AAAS, based on OMB Historical Tables in *Budget of the United States Government FY 2004*. Constant dollar conversions based on GDP deflators. FY 2004 is the President's request.  
Note: Some Energy programs shifted to General Science beginning in FY 1991.  
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# Human Capital Changes

Minorities traditionally have lowest completion rates in S&E fields.

Increases in BS degrees to minorities in the past few years, but NOT in advanced S&E degrees.

Figure 2-2.  
U.S. population of 18- to 24-year-olds, by  
race/ethnicity: 1980-2025



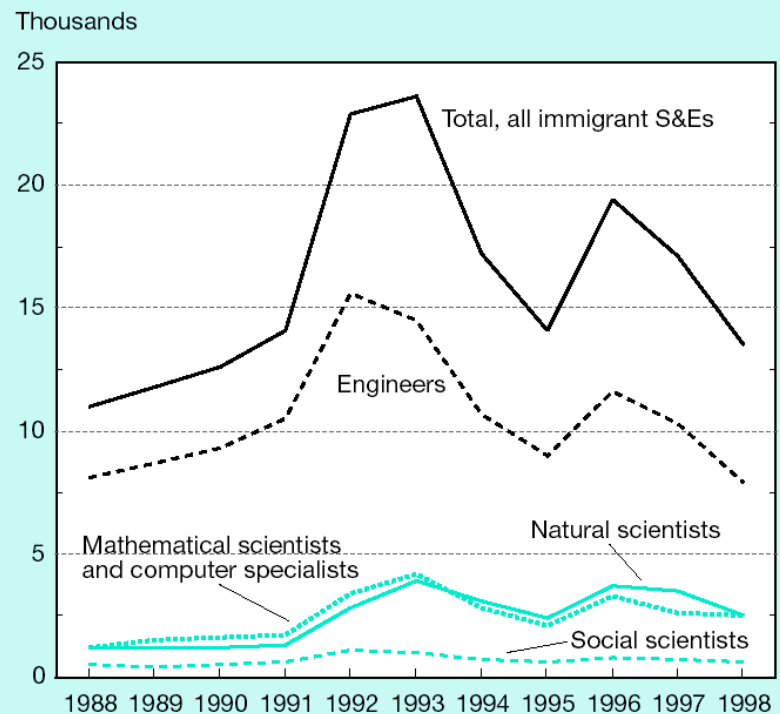
See appendix table 2-2. Science & Engineering Indicators – 2002

# Human Capital Changes

Balancing security w/ access to education.

- Foreign doctoral students in S&E fields represent significant fraction of totals ( $> 40\%$  in Natural Science and  $\sim 50\%$  in Engineering)
- Current stay rates for foreign students  $\sim 50\%$  on average and can be as high as  $90\%$  for some countries (e.g. China).

Figure 3-22.  
**Immigration and naturalization service counts of permanent visas to S&E occupations: 1988–98**



SOURCE: Immigration and Naturalization Service Administration Records.

*Science & Engineering Indicators – 2002*

# Large-scale R&D Trends

- “Small Science” is getting bigger, greater demands for large tools
- Many sciences becoming informational (Astronomy, Particle Physics, Biology/Genomics)
- Sciences are increasingly multidisciplinary
  - Astronomy – particle physics
  - Biology w/ math, computer science, physics
  - Materials with bio, chemical
- Science is increasingly international

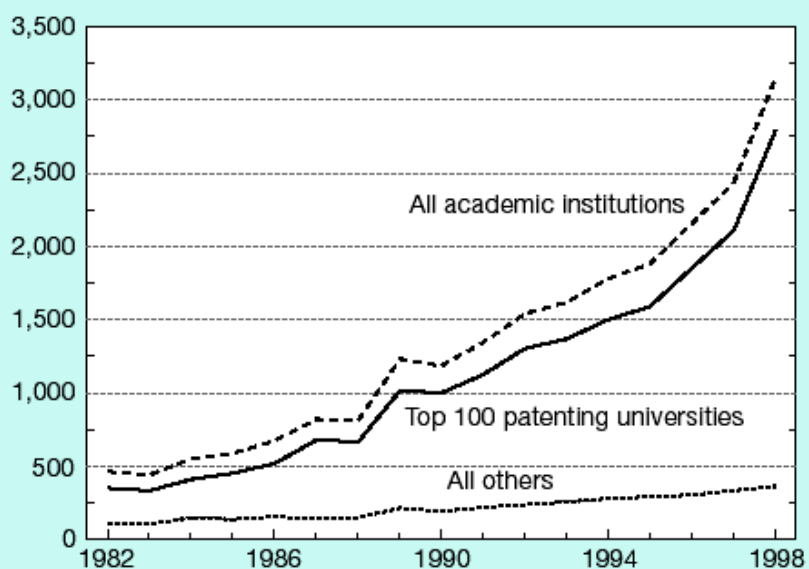
**BACKUP**

# **The 7 Mechanisms for Technology Transfer**

1. Licensing
2. Cooperative Research and Development Agreements
3. Technical Assistance
4. Reimbursable Work for Non-Federal Partners
5. Access and Use of Facilities
6. Exchange Programs
7. Conferences, Publications, Informal Exchange



Figure 5-48.  
**Granted academic patents: 1982–98**



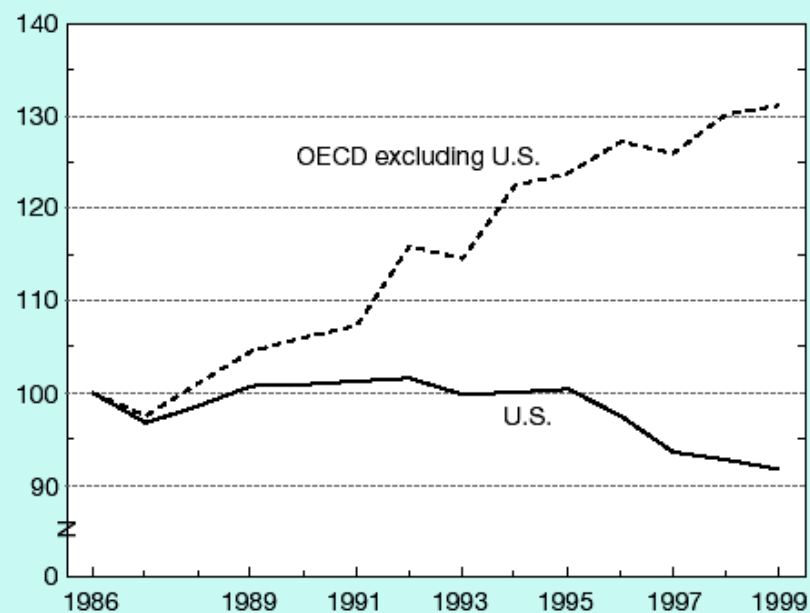
NOTE: Top 100 patenting universities are determined by the sum of patents awarded during the 1990s.

See appendix table 5-55.

*Science & Engineering Indicators – 2002*

Figure 5-33.  
**Output of scientific and technical papers for the U.S. and OECD: 1986–99**

1986 index = 100

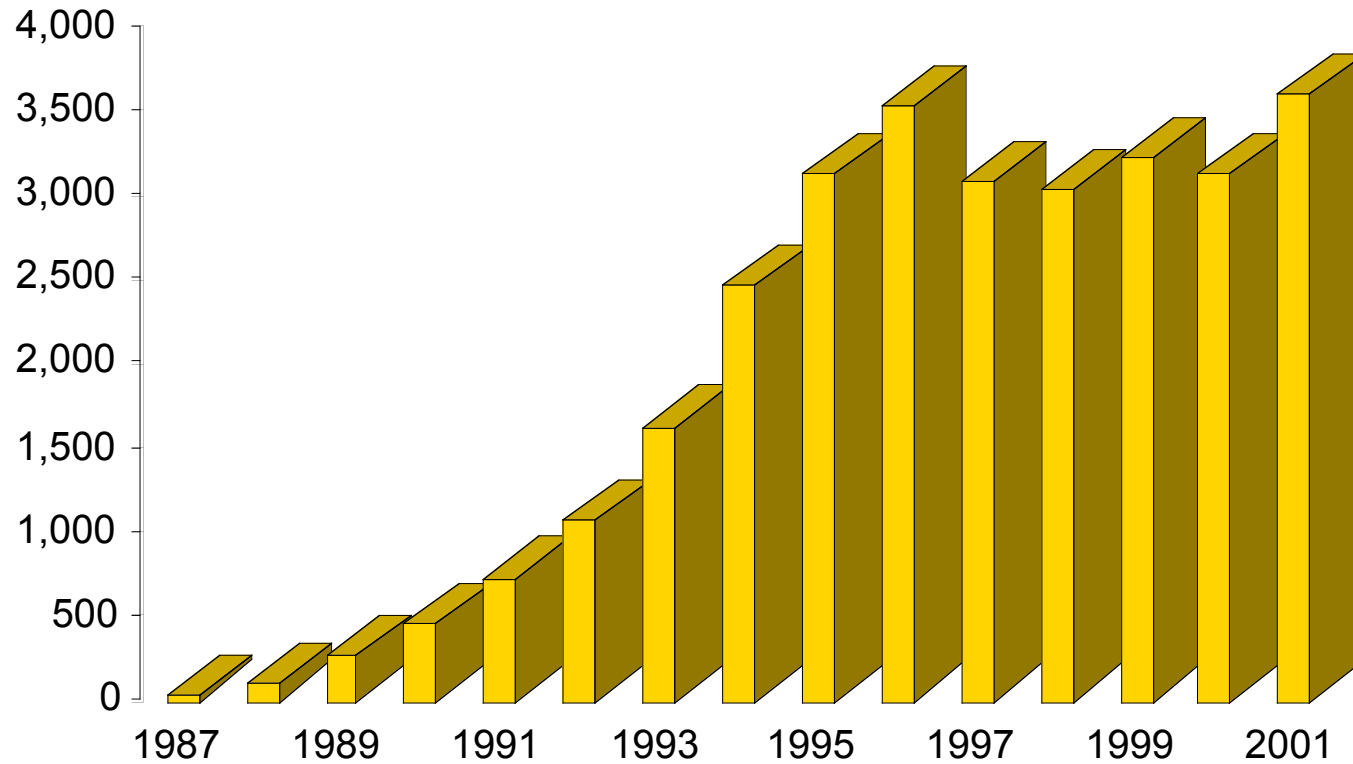


OECD = Organisation for Economic Co-operation and Development

NOTE: OECD count includes only high income (as defined by the World Bank) members.

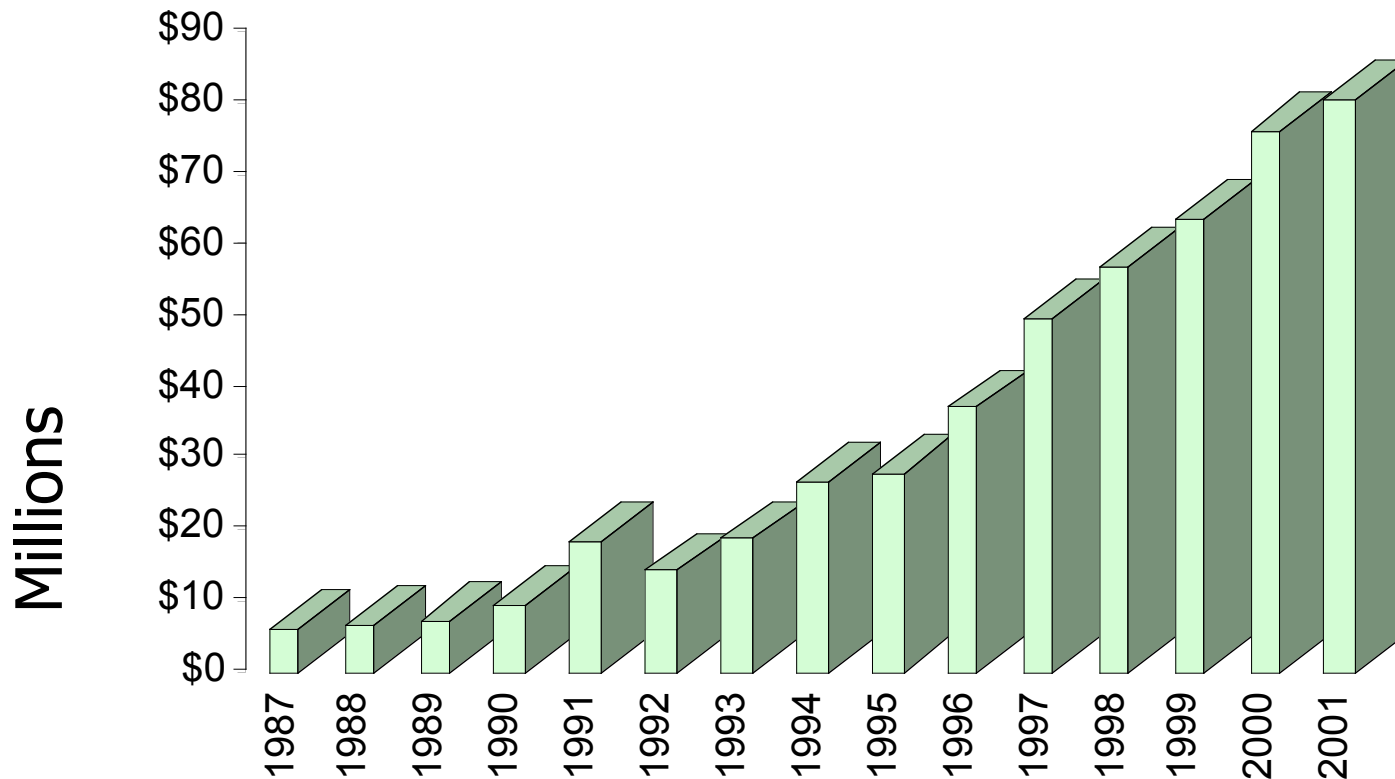
See appendix table 5-41. *Science & Engineering Indicators – 2002*

## Federal Agency CRADA Activity



Source: U.S. Department of Commerce, *Summary Report on Federal Laboratory Technology Transfer*, 2002

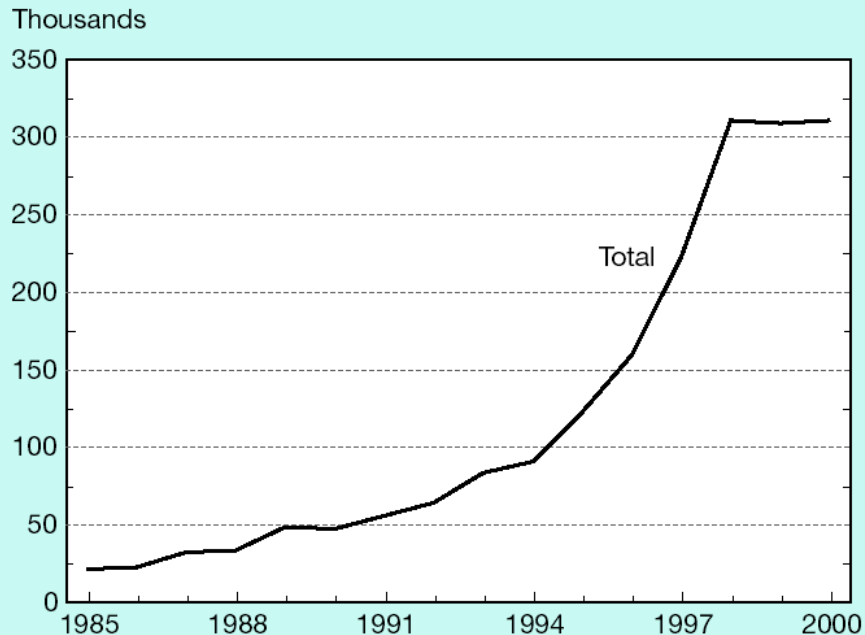
# Federal Lab Income from Licenses



Source: U.S. Department of Commerce, *Summary Report on Federal Laboratory Technology Transfer*, 2002

Figure 5-45.

**Number of citations in U.S. patents to scientific and technical articles: 1985–2000**



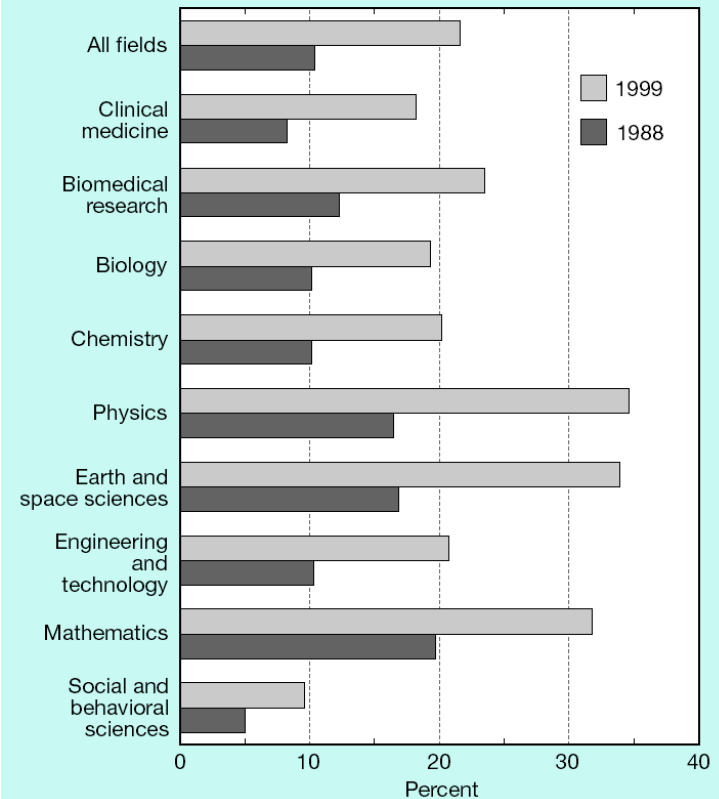
NOTES: Citations include all references to scientific articles. Citation counts are on the basis of a twelve-year period with a three-year lag; for example 2000 citations are references of U.S. patents issued in 2000 to articles that were published 1986–97. Changed U.S. Patent & Trademark Office procedures, greater ease of locating scientific articles, and greater incentive to cite them may have contributed to some of these increases.

SOURCES: U.S. Department of Commerce, Patent and Trademark Office; CHI Research, Inc., Science Indicators and Patent Citations databases; and National Science Foundation, Division of Science Resources Statistics.

*Science & Engineering Indicators – 2002*

Figure 5-39.

**U.S. international collaboration, by field**



NOTES: Social and behavioral sciences consist of social science, psychology, health, and professional sciences. Computer science is included in engineering and technology. Field volume is in terms of whole counts, where each collaborating institutional author is assigned an entire count.

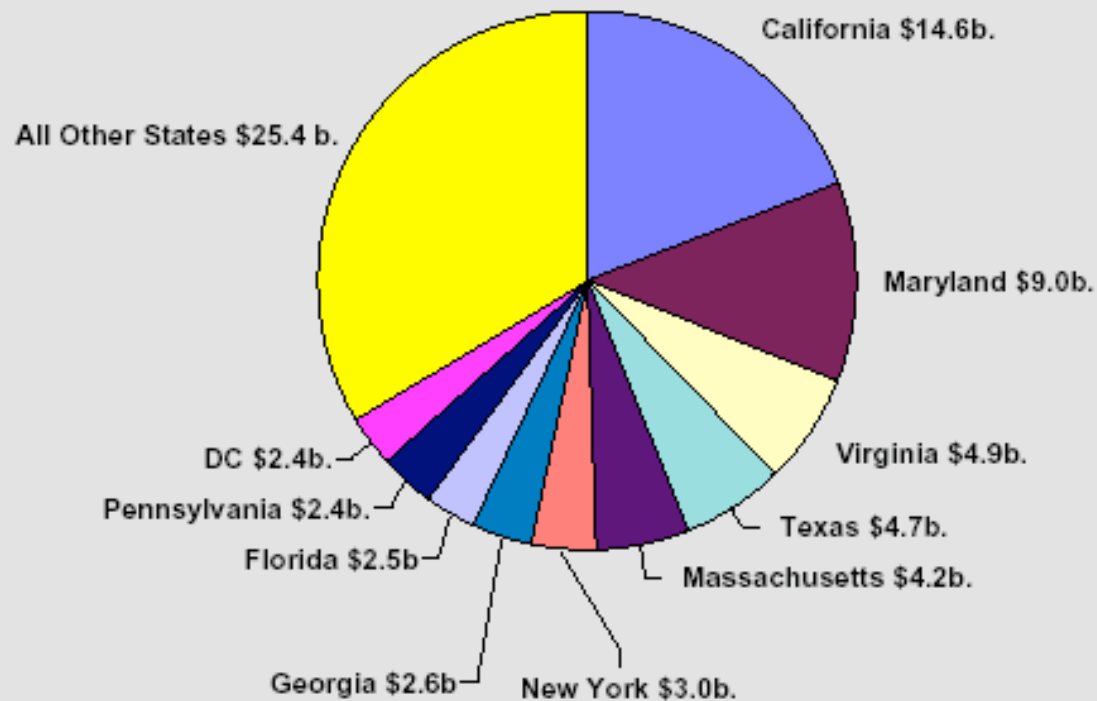
SOURCES: Institute for Scientific Information, Science and Social Science Citation Indexes; CHI Research, Inc., Science Indicators database; and National Science Foundation, Division of Science Resources Statistics.

*Science & Engineering Indicators – 2002*

## Federal R&D by State, FY 2000

(obligations in billions of dollars)

Total: \$75.8 billion



Source: National Science Foundation, Federal Funds for Research and Development, 2002.

R&D = conduct of R&D and R&D plant.

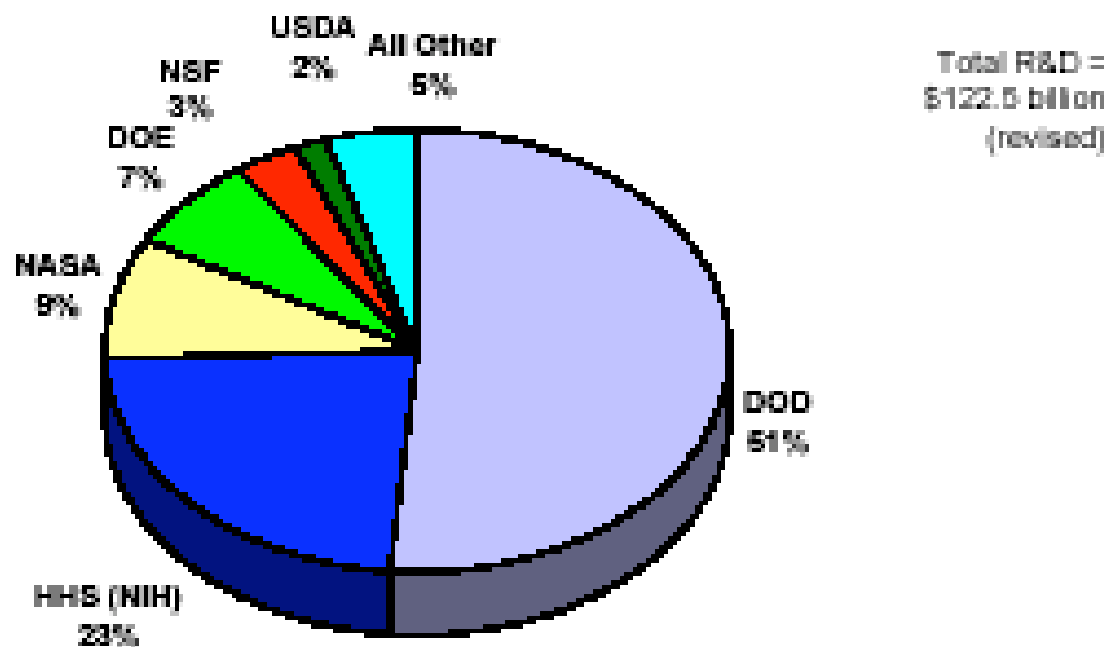
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## Total R&D by Agency: FY 2004 Proposed

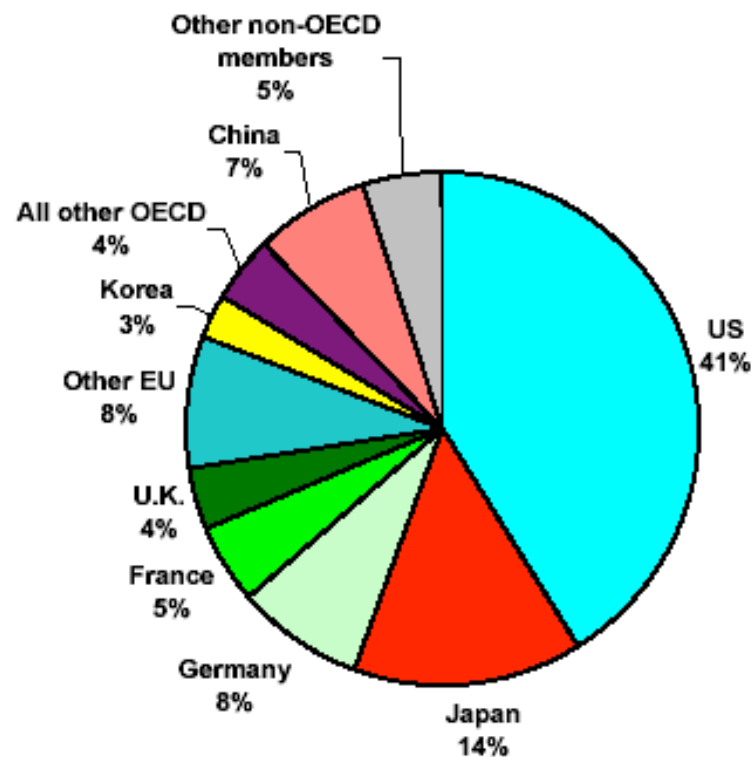
Budget Authority in billions of dollars



Source: AAAS, based on OMB R&D Budget Data and agency estimates for FY 2004.  
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## Shares of Total World\* R&D, 2000



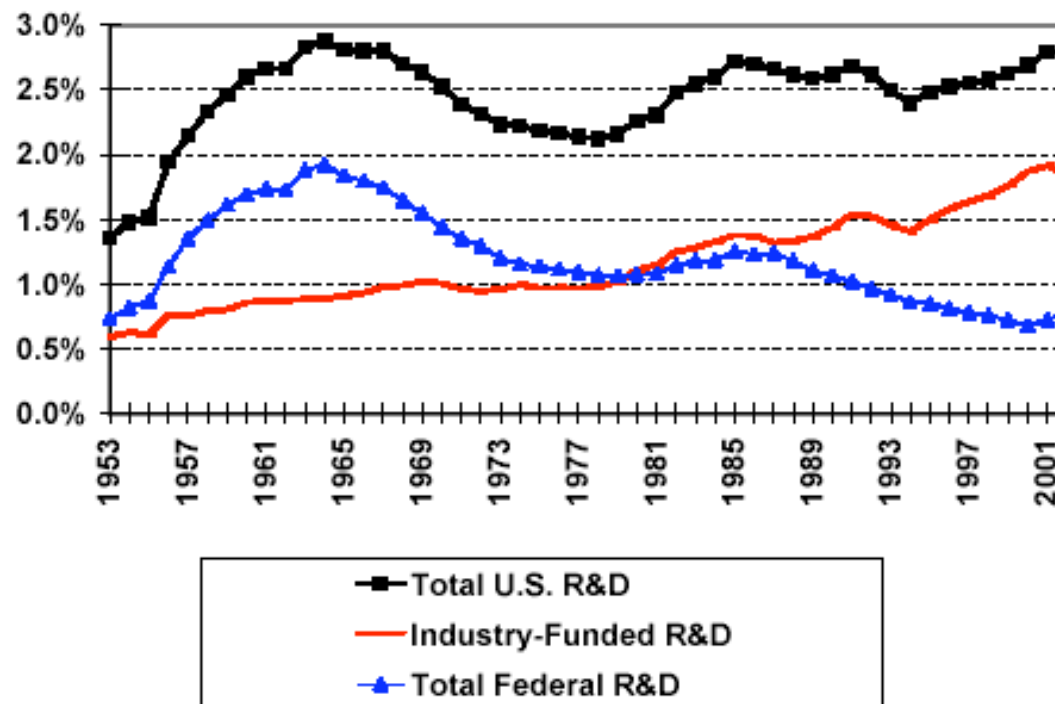
Total World\* R&D =  
U.S. \$686.9 billion\*\*

\* World = OECD members  
plus Argentina, China,  
Romania, Israel, Russian  
Federation, Singapore,  
Slovenia, Taiwan

Source: OECD, Main Science and Technology Indicators,  
2002.

## U.S. R&D as Percent of Gross Domestic Product

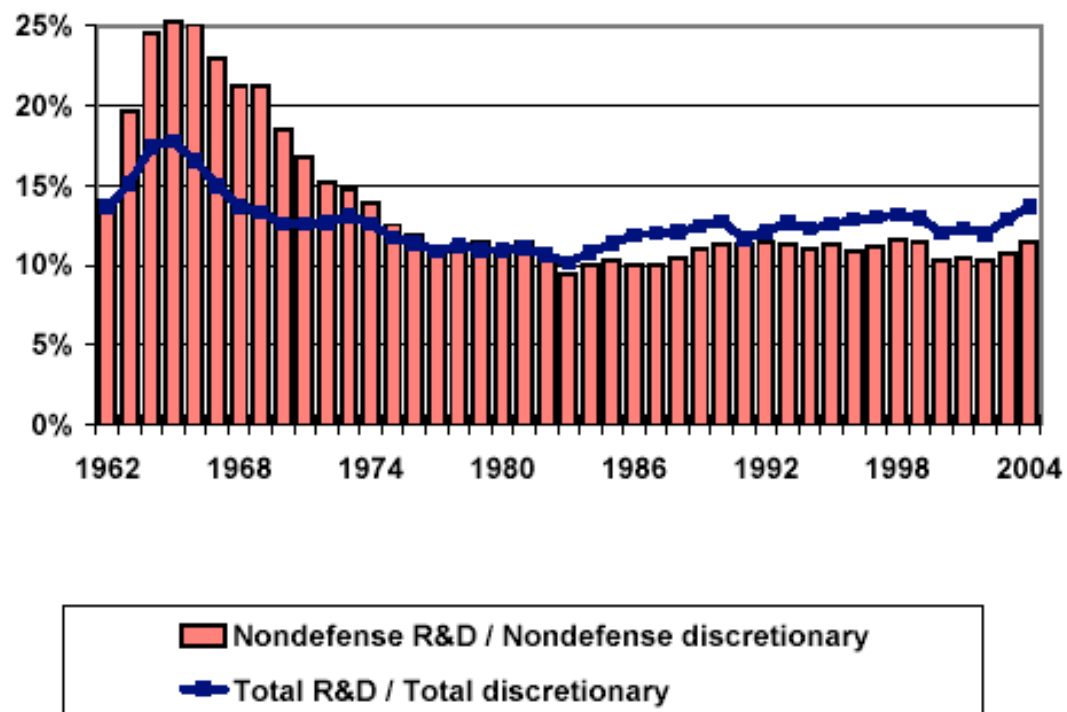
Total, Industrial, and Federal R&D - 1953-2002



Source: NSF, Division of Science Resources Statistics.  
2001 and 2002 data are preliminary. R&D funded by other  
sources (universities, nonprofits, etc.) included in Total U.S.  
R&D. Includes defense and nondefense R&D.  
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### R&D as Percent of Discretionary Spending: FY 1962-2004, in outlays



Source: AAAS, based on Budget of the U.S. Government FY 2004  
Historical Tables  
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